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**History of the diagnosis of a sexually transmitted disease is linked to normal variation in  
personality traits**

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***Abstract***

**Introduction:** Stable individual differences in personality traits have well-documented associations with various aspects of health. One of the health outcomes that directly depends on people's behavioral choices, and may therefore be linked to personality traits, is having a sexually transmitted disease (STD).

**Aim:** The study examines the associations between a comprehensive set of basic personality traits and past STD history in a demographically diverse sample.

**Methods:** Participants are 2,110 Estonians (1,175 women) between the ages of 19 and 89 years (mean age 45.8 years, SD = 17.0). The five-factor model personality traits (Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness) and their specific facets were rated by participants themselves and knowledgeable informants. Sex, age, and educational level were controlled for.

**Main outcome measure:** History of STD diagnosis based on medical records and/or self-report.

**Results:** History of STD diagnosis was associated with higher Neuroticism and lower Agreeableness in both self- and informant-ratings. Among the specific personality facets, the strongest correlates of STD were high hostility and impulsiveness and low deliberation.

**Conclusions:** Individual differences in several personality traits are associated with a history of STD diagnosis. Assuming that certain personality traits may predispose people to behaviors that entail a higher risk for STD, these findings can be used for the early identification of people at greater STD risk and for developing personality-tailored intervention programs.

## ***Introduction***

Normal variation among people in how they typically behave, feel, and think is often operationalized as a set of personality traits. Besides psychology, personality traits have relevance for other disciplines, including epidemiology and medicine. This is because personality traits are related to an increasing list of physical health outcomes, with the associations often posited as causal (1). For instance, personality traits may contribute to health via their associations with health-related behaviors, such as smoking, alcohol use, and physical exercise (2), via treatment adherence (3), or due to their regulatory role in coping with stress (4,5). However, not all health outcomes are equally likely to be linked to personality traits. Personality traits are more likely to contribute to those health conditions that strongly depend on people's own behavior than to those that are not directly under people's own control. Presumably, one of the health outcomes that depends rather directly on people's behavioral choices is having a sexually transmitted disease (STD). Having sex, especially when it is unprotected and involves multiple partners, is often (albeit not always) people's own choice.

Based on the existing empirical literature, there are at least three reasons to think that a history of having an STD may be related to particular personality traits. First, one of the strongest risk factors for STDs is having numerous sexual partners (6). It has been well documented that personality traits are related to sexual interest and activities. Within the framework of the Five-Factor Model of personality (FFM; 7), which postulates Neuroticism, Extraversion, Openness to experience (Openness), Agreeableness, and Conscientiousness as major domains of human personality differences, higher Extraversion and lower Agreeableness and Conscientiousness are associated with greater interest in short-term mating, uncommitted sex, and lack of relationship exclusivity, for both men and women (8,9). In a quantitative review, a higher number of sexual partners was most strongly linked to low Agreeableness and high Neuroticism (10). Second, another strong risk for contracting an STD is not using a condom (11). This risk factor, too, has been related to personality traits such as low Conscientiousness (12–14), low Agreeableness, and high Neuroticism (10). Third, studies link STDs to alcohol abuse (15), which is known to be associated with low scores on

Agreeableness and Conscientiousness, and high scores on Neuroticism (16).

Taken together, it can be hypothesized that having an STD is most strongly linked to low Agreeableness and Conscientiousness and high Neuroticism. Additionally, high Extraversion may contribute by implying more varied and numerous sexual relationships. The only FFM personality trait, then, for which there is less reason to expect an association with having an STD is Openness; however, even this trait may potentially be relevant, because a value dimension called Openness to Change has been reported to be higher in people with a history of an STD diagnosis (17). These hypotheses, however, are yet to be tested. To our knowledge, there are few, if any, studies that have examined the links between an STD diagnosis and the FFM personality traits.

Aiming to overcome the lack of empirical research on the topic, the present study examined cross-sectional associations between the FFM personality traits and the presence of a documented and/or self-reported STD diagnosis in a large and demographically heterogeneous sample of Estonians. Although, due to the lack of previous research on the topic, the study was largely exploratory in nature, it was motivated by the above-described hypotheses. Besides the broad FFM personality traits (domains) discussed above, numerous more specific aspects of the broad traits (facets) were measured. This provided more detailed insight into which specific aspects of personality may be associated with a history of an STD diagnosis. An additional strength of the current study was that information on participants' personality traits was based on two sources: the traits were rated by participants themselves and also by other people who knew them well (knowledgeable informants). Having multiple sources of personality data allowed for partial cross-validation of the findings: even if tested in the same people, associations that replicate across multiple types of ratings are more likely to be reliable than those that do not replicate (18). This is what is sometimes called “constructive replication” (19).

## ***Method***

### ***Participants***

Participants came from the Estonian Genome Centre (EGC) of the University of Tartu. In

accordance with the Estonian Human Gene Research Act, the EGC was launched as an initiative of Estonian Government in 2001 to create a database of health, genealogical, and genome data that would include 5% of Estonia's population (for details see [www.biobank.ee](http://www.biobank.ee)). The current EGC cohort includes over 51,000 people and roughly reflects the age, sex, and educational distribution of the adult Estonian population. Most of the EGC participants were randomly selected and recruited by general practitioners (GPs) and hospital physicians from among individuals visiting their offices. Additionally, volunteers were recruited in the EGC offices in Tallinn and Tartu (Estonia). Participants signed an informed consent form (available at [www.biobank.ee](http://www.biobank.ee)), filled out a computer-assisted personal interview at the doctor's office, and donated a blood sample. During the interview, participants were asked about their demographic, genealogical, educational, and occupational backgrounds, lifestyle, health status, and medical history. Reported medical conditions were coded according to the International Coding of Diseases (ICD-10). Where possible, participants' medical records were used to ascertain any self-reported diagnoses and to add unreported diagnoses.

A subset of the EGC cohort was asked to complete a comprehensive self-report personality questionnaire and to find a knowledgeable informant who could complete the same questionnaire about the participants. This subset included 600 of 1,000 randomly selected participants who had been interviewed earlier and were approached via mail with an additional request to provide personality information (i.e., 60% response rate), and 1,510 of the most recently joined participants who were willing to provide personality information. This subsample, including 2,110 people (1,175 women) with a mean age of 45.8 years ( $SD = 17.0$ , ranging from 19 to 89 years), was used in the present study. Of the 2,110 participants, 176 people had elementary (i.e., lower than secondary) education, 523 had secondary education, 573 had secondary specialized (vocational) education, and 838 had higher education (i.e., a university degree). This research was approved by the Research Ethics Committee of the University of Tartu (approvals: 206/T-4 22.08.2011; 166/T-21 17.12.2007; 170/T-38 28.04.2008).

### ***Measures***

*Personality.* The NEO Personality Inventory-3 (NEO-PI-3; 20) is a slightly modified version of the

NEO-PI-R questionnaire (21), one of the most widely used personality instruments. Like the original NEO-PI-R, the NEO-PI-3 has 240 items that measure 30 personality facets which are grouped into the five FFM domains, such that each domain score is a composite of six facet scores. The NEO-PI-R/NEO-PI-3 has excellent psychometric properties in a wide range of countries including Estonia (22). For example, retest reliabilities of the Estonian NEO-PI-R ranged from 0.67 to 0.86 for the five domains over two years (23). Participants themselves completed the self-report form of the NEO-PI-3, whereas informants completed the observer-report form. Of the informants (71.3% women), 50.8% were spouses or partners, 14.7% friends, 13.7% parents, 8.7% children or grandchildren, 6.2% siblings, 3.1% acquaintances, and 2.8% other relatives. In line with typical findings (24), the correlations between the respective scores based on self-reports and informant-ratings were 0.51, 0.66, 0.61, 0.48, and 0.52 for Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness, respectively, and ranged from 0.39 to 0.63 (median = 0.46) for the 30 facets (all correlations significant at  $p < 0.001$ ).

*Sexually transmitted disease (STD) diagnoses.* During the interview, participants were asked if they had ever been diagnosed with any of a number of diseases, including various types of STD. This information was combined with medical records to identify individuals who had a history of an STD diagnosis. For 119 participants (i.e., 5.6% of the total sample), such a diagnosis existed, either on the basis of medical records or self-reports, or both. Based on the ICD-10, 5 of these 119 diagnoses were early or unspecified syphilis diagnoses (A51, A53), 7 were gonococcal infections (A54), 66 were chlamydial diseases (A55, A56), 27 were trichomoniasis diagnoses (A59), 9 were herpes simplex diagnoses (A60), and 5 were other or unspecified sexually transmitted diseases (A63, A64). In the present sample, the incidence rate of STDs was higher than the estimate for general population [3.1% in 2001 and 1.6% in 2008, (25)], which may be explainable by the fact that participants' history of STD was based on multiple sources of information and therefore the likelihood of under-reporting was relatively low.

*Statistical analyses.* Associations with the STD diagnosis history (binary outcome) were tested using generalized linear models with a binomial outcome distribution and logit link. A separate and

identical model was run for each personality trait. Associations of different FFM domains with the STD diagnosis history were modeled separately. Most FFM traits are modestly to moderately intercorrelated (21) and would have therefore 'eaten' each other's predictive value in models with multiple personality traits. However, it remains an issue of ongoing debate in personality psychology (26) as to whether these intercorrelations are substantive (in which case 'eating' each other's predictive value would also be of true interest) or reflect methodological issues such as self- or informant-report biases (in which case 'eating' each other's predictive value would lead to distorted findings). Due to a high number of tests, we highlight only those personality-STD associations that were statistically significant at 1% alpha-level simultaneously for both self- and informant-rated personality traits. It has been argued (18, 27) that typical Bonferroni correction for multiple testing is not appropriate if predictor variables are not conceptually independent (self- and informant-ratings characterize the same people and the 30 facets largely reflect five broader traits). Instead, by means of a simulation we have previously shown that the 1% alpha level simultaneously for results based on self- and informant-ratings yields an appropriate likelihood of type 1 error in this sample (18).

## ***Results***

First, the effects of basic demographic variables such as age, sex, and educational level on the history of an STD diagnosis were tested. Age was significantly associated with having an STD diagnosis history, such that each additional year conferred 2.5% lower odds of having the diagnosis [odds ratio (OR) = 0.975, 95% confidence intervals (CI) = 0.962, 0.986;  $p < 0.001$ ]. Women had 1.7 times higher odds of having had a diagnosis than men (OR = 1.678, CI = 1.141, 2.509;  $p < 0.01$ ). Finally, an STD diagnosis history was more common among people with higher education (52.9% of people with STD diagnoses and 39.0% without it had higher education), whereas the trend was reversed at lower educational levels (Fisher's exact test for count data:  $p < 0.02$ ). Therefore, age, sex, and educational level, which are all known to be related to personality trait levels (28), were included as co-variates when testing personality trait-STD associations.

People with a history of an STD diagnosis had higher Neuroticism and lower Agreeableness, based



on both self- and informant-ratings (Table 1). One standard deviation lower self-rated/informant-rated Agreeableness incurred 1.45/1.30 times higher odds of having had an STD. A standard deviation higher self-rated/informant-rated Neuroticism incurred a 1.29/1.31-fold increase in the odds of having had an STD. Contrary to our hypotheses, however, Extraversion and Conscientiousness domains were not significantly associated with having had an STD diagnosis.

At the level of personality facets, STD diagnosis history was associated with higher scores on (self-rated/informant-rated) N2: Angry Hostility (OR = 1.38/1.39), N5: Impulsiveness (OR = 1.31/1.45) and lower scores on C6: Deliberation (OR = 1.28/1.36). For the Agreeableness domain, none of the facets reached the chosen threshold of statistical significance: apparently the significant domain-level effect had resulted from a cumulative contribution of several specific facets. The pattern of effect sizes was similar in self- and informant-ratings: the correlation between the respective vectors of odds ratios linking the 30 personality facets with STD diagnosis was  $r = 0.88$ .

### *Discussion*

The study showed that several FFM personality traits—a comprehensive operationalization of normal human personality variation (7)—are associated with a history of an STD diagnosis. In particular, participants with a history of an STD diagnosis had higher scores on Neuroticism—especially on its hostility and impulsiveness facets—and lower scores on Agreeableness and the deliberation facet of Conscientiousness, compared to those lacking such a diagnosis.

There is some evidence for personality pathology, such as a borderline personality disorder, being associated with having an STD (29,30). This is in line with the present findings, as borderline personality disorder has been shown to be characterized by high Neuroticism and low Agreeableness and Conscientiousness, with the associations partly occurring due to shared genetic influences (31, 32). Also, one study (33) reported that people with several STD diagnoses had higher scores on the antisocial personality scale of Millon Clinical Multiaxial Inventory, an instrument used for screening personality disorders (334). This is also consistent with the present findings, as antisociality is exactly what characterizes people with low Agreeableness and high hostility scores. Thus, the present results corroborate previous findings relating STD diagnosis to

personality disorders, but also extend them in showing that not only personality pathology as such is predictive of STD, but also normal personality variation.

The facet-level findings linking STD history to high impulsiveness and low deliberation make theoretically good sense as they refer to the roles of poor self-control and planning ability, which are indeed likely to contribute to risky behavior. That being said, somewhat more surprisingly, one of the strongest correlates of STD history among the 30 facets was hostility. This may show that easily irritable people are more likely to expose themselves to situations that entail STD risk. This is perhaps explainable by irritable people seeking emotional relief from behaviors such as alcohol and drug abuse (16,35) and, often relatedly, sexual activity. On the other hand, the combination of high impulsivity and hostility has also been linked to other health outcomes that are, to an extent, influenced by people's behavioral choices: for example, metabolic syndrome (36). This suggests that this combination of personality characteristics may reflect a more general vulnerability.

Because the present study was cross-sectional, it was impossible to empirically test whether the associations between personality traits and history of an STD diagnosis were causal, let alone establish the direction of causality. However, as can be seen from the introductory section, there are good theoretical reasons to believe that certain personality trait levels including high Neuroticism and low Agreeableness may predispose people to situations and behaviors (varied sexual relationships, condom non-use, and alcohol consumption) that entail greater risk of contracting an STD. All this would suggest a causal role of personality traits in predisposing people to STD contraction. That being said, it is not possible to rule out alternative explanations. For instance, although theoretically less likely, it is possible that having an STD diagnosis (predominantly chlamydia or trichomoniasis, based on the incidence reported above) systematically alters people's personality traits. Likewise, there may have been spurious, unconsidered variables that simultaneously affected personality traits and predisposed people to having an STD. Further, preferably longitudinal studies are needed to tackle the issue of causality in the association between personality traits and having an STD.

From the theoretical point of view, the present findings may show that people's enduring

dispositional traits, even if they describe normal variation among people, can expose them to a greater risk of contracting an STD. As such, personality traits can be seen as distant, inherent risk factors for STDs. This brings us to the possible practical implications of the findings. First, it is possible that assessing the levels of stable (37) personality traits provides a method for the early identification of people at a greater risk of contracting an STD. Such assessments can be, and in fact are sometimes, routinely done (e.g., in clinics). It is perhaps worthwhile to stress at this point that STDs also include HIV, which is a great public health concern in many populations, including Estonia (38), making the prediction of STD risk yet more important. Second, it is likely that interventions that target changes in risky behavior will be more successful if they consider the personality characteristics of the people who need these interventions the most. For instance, behavioral interventions may be successful if they ameliorate coping skills in people with specific personality-related vulnerabilities (389). In the case of STDs, some of the specific vulnerabilities may be related to hostility and disagreeableness, impulsiveness, and poor behavioral planning ability.

The finding that the prevalence of an STD diagnosis is higher among women confirms previous findings (6). Although older people had had more time to be diagnosed with an STD than younger people, the observed inverse association between age and history of an STD diagnosis may be explainable by older people underreporting diagnoses obtained many years earlier (perhaps partly due to forgetting) and there being no medical records for these people. Similarly, the likelihood of having an STD without a proper diagnosis may have been higher in the past, when older participants were sexually more active. The finding that higher educational level was associated with higher likelihood of having had an STD diagnosis may be explainable by less educated people being more likely to be under-diagnosed (e.g., due to less regular clinic attendance).

The strengths of the study include a relatively large and demographically diverse (although not strictly population-representative) sample and detailed and multiple informant-based information on participants' personality traits. A limitation is that there might have been misreporting of the STD diagnoses: not all diagnoses of STDs were based on medical records and even the records may have

been incomplete for various reasons. We note, however, that a completely objective and accurate assessment of the history of STDs (which possibly requires laboratory tests) is difficult in large epidemiological studies. Assuming that accuracy of reporting an STD diagnosis may be related to personality traits, such that people with higher Neuroticism and lower Agreeableness and Conscientiousness tend to under-report diagnoses, for example, could imply that the observed associations were under-estimates.

To conclude, normal individual differences in broad personality traits such as Neuroticism and Agreeableness and specific traits such as hostility, impulsiveness and deliberation may need to be included as distant risk factors in the etiology of STDs. This knowledge may potentially prove useful for attempts to prevent STDs, which are a great and costly public health concern (40).

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Table 1. Associations (odds ratios with 95% confidence intervals) between the five FFM personality domains, their facets, and history of an STD diagnosis.

	Self-ratings of personality	Informant-ratings of personality
<i>FFM domains</i>		
Neuroticism	1.288[1.067;1.556]**	1.311[1.080;1.591]**
Extraversion	1.163[0.952;1.423]	1.219[0.999;1.493]
Openness	1.082[0.879;1.332]	1.059[0.866;1.294]
Agreeableness	0.688[0.569;0.833]***	0.771[0.638;0.934]**
Conscientiousness	0.842[0.699;1.017]	0.818[0.679;0.988]*
<i>Facets of FFM domains</i>		
N1: Anxiety	1.240[1.026;1.502]*	1.240[1.016;1.513]*
N2: Hostility	1.384[1.153;1.662]***	1.385[1.146;1.674]**
N3: Depression	1.073[0.892;1.288]	1.085[0.896;1.310]
N4: Self-Consciousness	1.135[0.941;1.368]	0.937[0.771;1.135]
N5: Impulsiveness	1.314[1.083;1.596]**	1.445[1.192;1.756]***
N6: Vulnerability to Stress	1.132[0.937;1.361]	1.275[1.059;1.528]**
E1: Warmth	0.859[0.715;1.035]	1.063[0.878;1.294]
E2: Gregariousness	1.149[0.947;1.397]	1.184[0.974;1.443]
E3: Assertiveness	1.195[0.991;1.443]	1.235[1.020;1.498]*
E4: Activity	1.258[1.038;1.528]*	1.241[1.020;1.514]*
E5: Excitement Seeking	1.083[0.868;1.355]	1.141[0.924;1.412]
E6: Positive Emotion	1.133[0.930;1.387]	1.030[0.846;1.258]

Table 1 continued...

	Self-ratings of personality	Informant-ratings of personality
<i>Facets of FFM domains</i>		
O1: Openness to Fantasy	1.030[0.843;1.261]	1.010[0.832;1.223]
O2: Openness to Aesthetics	0.880[0.723;1.072]	0.858[0.702;1.046]
O3: Openness to Feelings	1.329[1.084;1.636]	1.081[0.886;1.323]
O4: Openness to Actions	1.149[0.944;1.398]	1.184[0.969;1.447]
O5: Openness to Ideas	0.987[0.812;1.201]	0.997[0.819;1.213]
O6: Openness to Values	1.141[0.927;1.400]	1.276[1.055;1.540]
A1: Trust	0.810[0.675;0.974]	0.932[0.773;1.128]
A2: Straightforwardness	0.839[0.691;1.020]	0.782[0.648;0.944]
A3: Altruism	0.791[0.660;0.950]*	0.867[0.720;1.048]
A4: Compliance	0.751[0.619;0.908]**	0.808[0.666;0.979]*
A5: Modesty	0.777[0.639;0.946]*	0.790[0.654;0.956]*
A6: Tendermindedness	0.738[0.612;0.892]**	0.816[0.673;0.991]*
C1: Competence	0.926[0.767;1.120]	0.852[0.706;1.031]
C2: Order	1.008[0.837;1.219]	0.957[0.792;1.160]
C3: Dutifulness	0.799[0.661;0.968]*	0.801[0.667;0.967]*
C4: Achievement Striving	0.919[0.763;1.108]	0.959[0.792;1.164]
C5: Self-Discipline	0.845[0.706;1.013]	0.834[0.694;1.006]
C6: Deliberation	0.782[0.648;0.944]** <sup>a</sup>	0.735[0.610;0.887]***

NOTE:  $N = 2,051$ – $2,092$  for self-ratings.  $N = 2,019$ – $2,068$  for informant-ratings. Predictor variable unit is one standard deviation. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ , \*\*<sup>a</sup>  $p = 0.01$  (as a result, we interpreted the association between C6: Deliberation and an STD diagnosis as statistically significant). Age, sex, and educational level were controlled for. The first letter of each facet name indicates the FFM domain to which it belongs.